GasCheck R2pc User Manual V1.6

Part Number 19042 **www.ionscience.com**

Advanced Gas Sensing Technologies

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Declaration of conformity

Manufacturer: Ion Science Ltd, The Way, Fowlmere, Cambridge, England. SG8 7UJ

Product: GasCheck R2pc

Product description: a handheld leak detector specifically designed for the detection and measurement of refrigerant and air-conditioning gases.

Directives: 89/336/EC EMC

Standards: BS EN 61010-1:2001 Safety requirements for measurement, control & lab equipment
BS EN ISO 9001:2000 Quality management systems
BS EN 61326-1:1997 EMC – Equipment for measurement, control and laboratory use

I the undersigned herby declare that the equipment specified above conforms to the stated Directives and Standards.

Signed By:

Name: Mark Stockdale,
Position: Technical Director
Date: 23rd April 2007

Safety: GasCheck R2pc complies with the requirements of 73/23 EEC low voltage directive and, apart from a low voltage pump, there are no moving parts within the instrument so that the machinery directives are not applicable.

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1. INTRODUCTION

1.1 Scope and definitions

This manual provides installation, operation and maintenance instructions for the Gas Check R2. You must use the Gas Check R2 as specified in this manual. Read this manual before you install and operate the Gas Check. Important safety information is highlighted as WARNING and CAUTION instructions; you must obey these instructions. The use of WARNINGS and CAUTIONS is defined below.

> WARNING
> Warnings are given where failure to observe the instruction could result in injury or death to people.

> CAUTION
> Cautions are given where failure to observe the instruction could result in damage to the equipment, associated equipment and process.
>
> PLEASE ENSURE THE INSTRUMENT IS PLUGGED TO THE MAINS ADAPTER WHEN NOT IN USE.

The units of measurement used throughout this manual conform to the SI international system of units of measurement

1.2 Description

Gas Check R2pc, shown in Figure 1 below, is a portable, battery-powered, hand-held refrigerant gas leak detector, detecting the presence of refrigerants in air by means of their adsorption on a semi conducting surface. The GasCheck R2 is suitable for leak detection of most refrigerants, including R134a. A comprehensive list of sensed gases is given in Table 1 on Page 4.

There are provisions for sensor heating and battery charging within the GasCheck R2 Mk2 design, enabling its immediate deployment when required. Indications of a leak are shown on the digital display Figure 1, (2) and are also given by a front panel mounted LED flasher (3) and as audible clicks from the rear panel loud speaker (6).

The GasCheck R2 includes a convenient storage and carrying case, together with a spare battery holder, the mains powered 6V DC power supply and connection cord for battery charging and sensor regulation, and a long flexible probe.

1.3 Principal of operation

When switched ON, the GasCheck R2 automatically waits for the sensor response to stabilise in the ambient environment. Then, the instrument either enters *Peak Mode* for gas leak measurement or *Roaming Mode*, for location of gas leaks and emissions, according to which mode of operation last used.

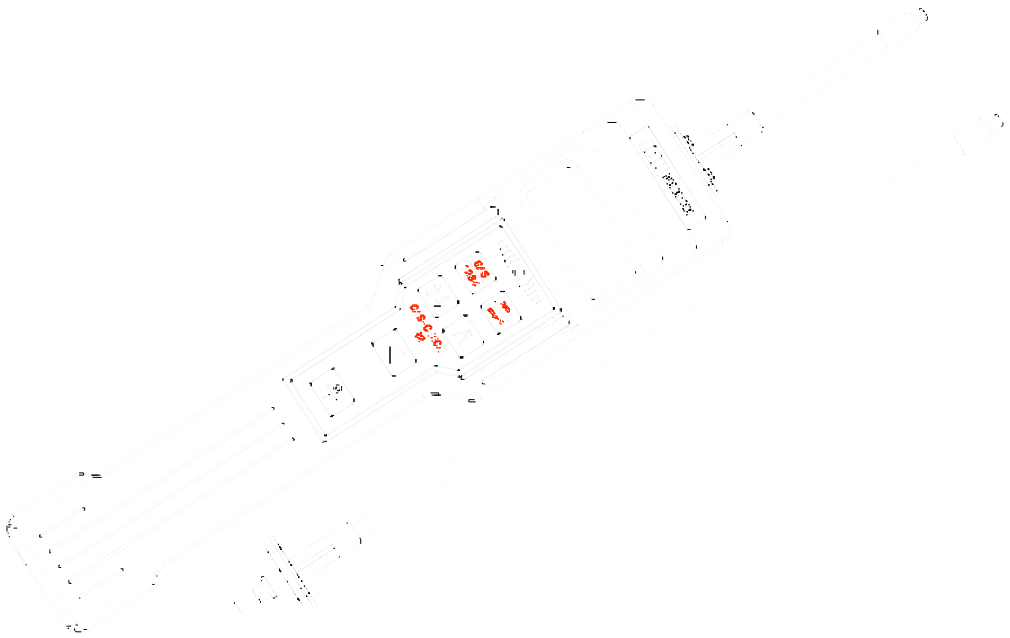
In Peak Mode, a clear 'tick' will be heard on the audio every 10 seconds or so. When the sample drawn into the detector contains traces of refrigerant gas, then this will be displayed and the audio tick will rapidly increase in frequency. The maximum response of the instrument relative to the previously registered background is converted into a leak measurement of either ppm (as registered within the instrument), or gm/yr (adjusted for the instrumental rate of sample gas intake).

In *Roaming* Mode, the '-' sign leading the bar graph in the left hand side of the display will be seen to flicker on and off occasionally. This indicates that the detector response to background gas is continuing to decrease, and that the instrument is therefore re-zeroing. It will be particularly observed on power-up and when the instrument is removed from a gas leak.

1.4 Applications

You can use the GasCheck R2 on many types of applications, including those listed below.

- *Manufacturing:* quality assurance testing on manufactured component seals.
- *Industrial:* the detection of leaks from gas installations, in cylinder receiving rooms, from pipe assemblies and flanges, the detection of leaks from stored gases in drums and vessels.
- *Medical*: the detection of leaks from anaesthetic gas bottles, pipe conduit, and the integrity testing of membrane materials, glove boxes….



1	Probe	4	Key pad
2	Display	5	Power socket
3	LED flasher	6	Loudspeaker

Figure 1 – The GasCheck R2 Mk2

1.5 For optimum instrument performance

If instrument is to be used for ultimate noise free leak detection then the following is recommended.

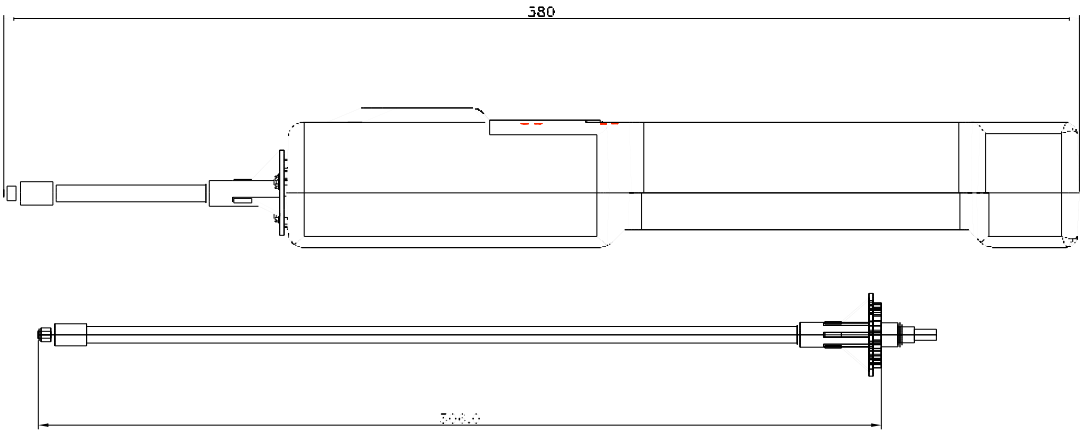
When not in use it is the instrument should remain plugged into the mains adapter with the instrument switched off. This is recommended as it applies constant power to the sensor to keep it in a clean state and ready for immediate use.

If the instrument is stored, with the batteries removed or not plugged into a mains adapter with power applied, for a length of time then it is recommended that the instrument be put on permanent charge as above for a period of time prior to use. The recommended time would be hours to days in the off state if stored in heavily contaminated environment, else can be foreshortened as the need dictates. Therefore, if the instrument is left in the off state for 7 days then charge for 7 hours. If it is left for 50 days, charge for 50 hours.

2 TECHNICAL DATA

2.1 General

Operating temperature range			
	GasCheck R2	0 to 50 °C	32 to 122 °F.
Storage temperature range			
		-25 to 70 °C	-13 to 158 °F.
Materials of construction			
	Storage case	PPE, polyester foam insert	
	GasCheck R2	Polyurethane casing	
Dimensions			
	Storage case	420 x 320 x 97 mm	16.5” x 12.5” x 3.75 “
	GasCheck R2	see Figure 2	
Mass			
	Including storage case	1.6 kg	3.5 lb.
	GasCheck R2	0.5 kg	1.0 lb.
Ingress ratings			
	Minimum	IP20	



* Length of long probe fitted to GasCheck R2

Figure 2 – Dimensions of GasCheck R2 with short probe fitted (mm)

2.2 Performance

Detector type: Heated ceramic semi-conductor oxide

Gases Detected: Most refrigerant gases and volatiles, see Table 1

For effective leak measurement of a target gas, gases are classed into one of four Gas Groups, as shown in Table 1. Each group has a characteristic calibration curve assigned to it in the instrument's memory. The table only lists refrigerant gases that have been tested by the manufacturer. If the gas or gas mixture that you seek is not included in Table 1, select group III, which delivers a large (and therefore most conservative) estimation of leak rate.

Minimum response time: (search mode)	About 2 seconds for 15 g/year leak
Recovery time: (search mode)	About 4 seconds for 15 g/year leak
Maximum signal measurable	30 g/year or 2000ppm
Flow rate through the Probe	15ml/sec
Smallest leak detection levels:	see Table 1

Gas	Gas group	lower detection limit (ppm)	lower leak detection limit (mbar.L /min)	lower leak detection limit (gm/yr)
R32	1	0.16	$2.5 . 10^{-6}$	$7 . 10^{-4}$
R1303	1	0.10	$1.6 . 10^{-6}$	
R20 (chloroform)	1	0.10	$1.6 . 10^{-6}$	$10 . 10^{-4}$
R30 (dichloromethane)	1	0.20	$3.2 . 10^{-6}$	$14 . 10^{-4}$
R22	1	0.63	$1.0 . 10^{-5}$	$5 . 10^{-3}$
Acetone	1	0.04	$6.7 . 10^{-7}$	$2 . 10^{-4}$
R33	1			
Isopropanol	1	0.10	$1.6 . 10^{-6}$	$5 . 10^{-4}$
Diethyl ether	1	0.14	$2.3 . 10^{-6}$	$9 . 10^{-4}$
Ethyl acetate	1	0.08	$1.3 . 10^{-6}$	$6 . 10^{-4}$
Toluene	1	0.16	$2.6 . 10^{-6}$	$13 . 10^{-4}$
Hexane	1	0.032	$5.1 . 10^{-7}$	$2 . 10^{-4}$
R134a	2	0.79	$1.3 . 10^{-5}$	$7 . 10^{-3}$
R502	2	1.26	$2.0 . 10^{-5}$	$1 . 10^{-2}$
R12	3	13.3	$2.1 . 10^{-4}$	$1 . 10^{-2}$
R11	3			
R407c (blend)	4	56.2	$9.0\ 10^{-4}$	$5 . 10^{-2}$

Table 1- Leak Detection thresholds

Notes:

Each successive gas group number corresponds to a decrease in sensor responsivity by a factor of 10. A gas such as R32 is very readily sensed by the instrument; hence it is placed in gas group 1. This means that the instrument is able to operate in contaminated background conditions when searching for R32, with minimal risk of interference from other fugitive gases.

2.3 Battery data

Note: the energy storage capacity of batteries is affected by temperature. The data in Table 2 is for an ambient temperature of 20 °C (68 °F).

WARNING

GasCheck R2 Mk 2

includes a battery recharging and sensor heater control facility.

Never use the instrument, its battery re-charger, in a hazardous area.

The GasCheck R2 can be used with primary (disposable) batteries.

There is a provision for the recharging of ISL batteries within the GasCheck R2.

Do not substitute any Ion Science parts within the GasCheck R2

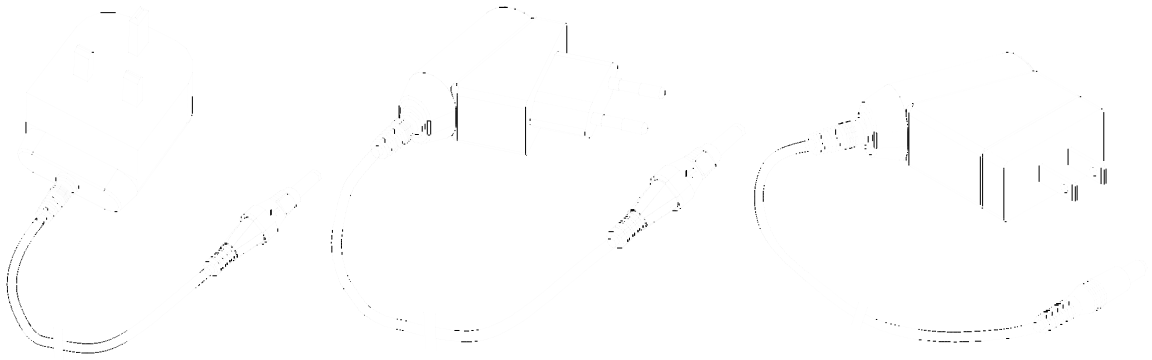
Number of batteries required 4
Battery type Nickel Metal Hydride Rechargeables, size AA
For other acceptable battery types see Table 2.

Battery type	**Battery life (hours)**
	Gas Check R2
NMHi re-chargable	6
LR6 (R6)	4
MN1500	4

Table 2 – Average battery life without recharging

2.4 Charger plugs

The charger plugs available are for single phase supply sockets in UK, Europe and USA as shown below:



2.5 Outputs

Audio Fixed volume variable frequency blip from internal piezo-speaker at rear of unit

Visual Ten segment bar graph and direct reading with exponent and units on LCD display

Indicators Flashing LED red light alert on keypad panel

Alarm The alarm warbles at 15g/year (0.5 oz per year)

The audio sounder and a flashing LED indicator are activated in positive response of the gas sensor, and upon pressing operation keys.

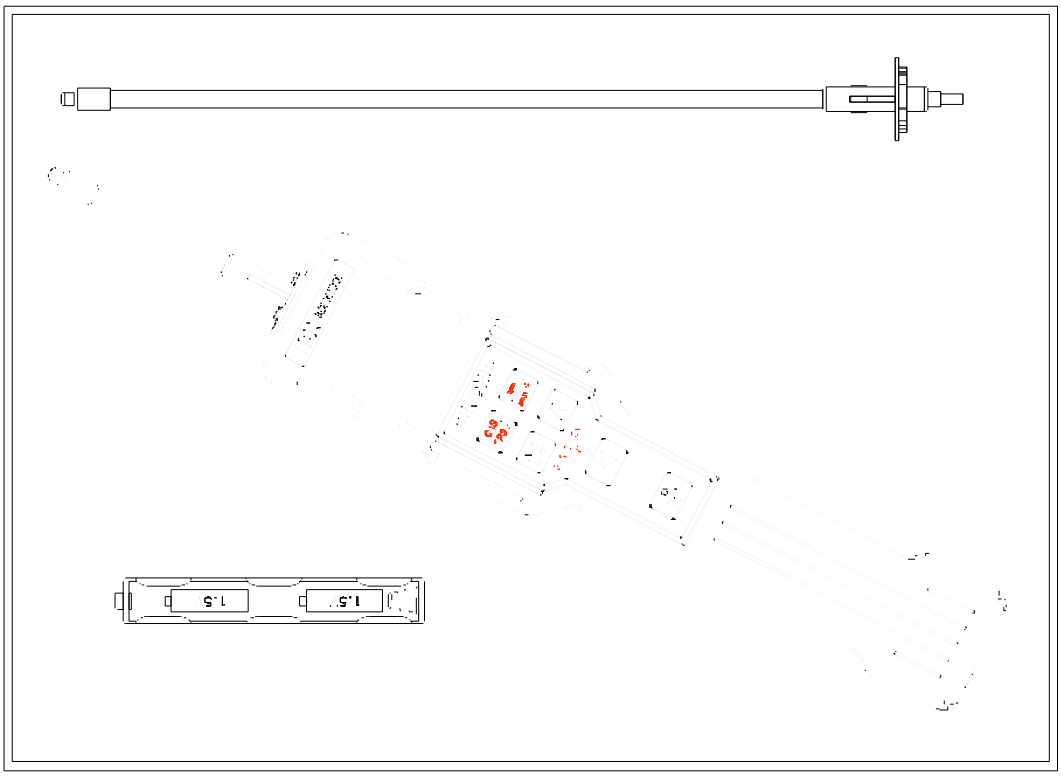
3 INSTALLATION

Remove all packaging materials, then open the storage case and inspect the equipment. If the storage case or any other item is damaged, notify your supplier and the carrier in writing within three days; state the Item Number and the Serial Number stamped on rear case of the GasCheck, together with your order number and your supplier's invoice number. Do not use the GasCheck if any item is damaged.

Refer to Figure 3 and check that the storage case contains the items listed in Table 3. If any item is missing, notify your supplier in writing within three days.

Qty	Description	Check ( )
1	GasCheck R2 Mk2	
1	Long probe	
1	Spare battery holder with 4 batteries	
1	Power plug (if ordered)	

Table 3 – Checklist of items in the storage case



1. Long probe
2. GasCheck R2
3. Spare battery holder
4. Power plug (if ordered)

Figure 3 – Items in the storage case

Open the storage case and remove the GasCheck. The GasCheck is supplied with the short probe fitted.

To interchange probes, loosen the three screws S, Figure 4, attaching the probe to the instrument. Rotate the probe clockwise by a one eighth turn to release it from its fitting. Replace with the alternate probe and reverse the procedure.

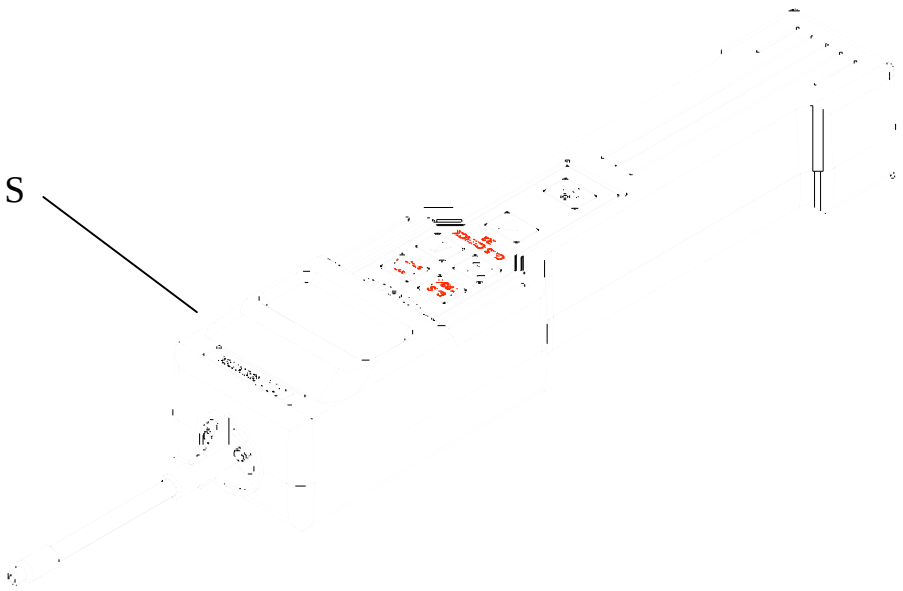


Figure 4 – Probe replacement. Position of one of three screws S is indicated, and direction of removal of the probe.

CAUTION
Do not bend the long probe through sharp angles, as this will reduce its mechanical life. A 45 degree bend at the end of the probe is all that is normally required.
Hold the bayonet connection when attaching or removing the probes to the instrument.

4 OPERATION

Having assured that the instrument is fitted with the correct probe, familiarise yourself with key operation described below.

4.1 Control buttons

Refer also to Figure 4 overleaf for key operation. The display panel is described in Section 4.2.2.

POWER (1) Press this key to switch the GasCheck R2 on and off. The instrument will be operable after between 15 and 120 seconds, depending on when the instrument was last used and background contaminants in the air. Ideally the instrument should be plugged into the battery charger when not in use. This ensures that the sensor is retained in a stabilised condition ready for use.

ZERO (2) Press zero to re-zero the instrument due to a drift in background response incurred, for example, on relocating the instrument from one room to another. In *Peak mode*, pressing the zero button will return the instrument to State 1. In *Roaming mode*, the instrument display is immediately zeroed to the registered instrument response.

ROAMING MODE and TOGGLE (3) This is a mode key, allowing for dynamic and continuous instrument response in search of leaks or location of emissions of the target gas. From Peak mode, activation of this key enters the instrument into either the high or low sensitivity setting previously selected. Additional key presses toggle between high and low sensitivity, as indicated by the instrument display showing 'L' or 'H'. The sensitivity changes by a factor of 16 between H and L ranges.

GAS/1234 SELECTION (4) Operable only in *Peak mode.* Use this to change the Gas Group setting. The most recently used gas group setting is recovered on power up. See Table 4 for Gas Group selection.

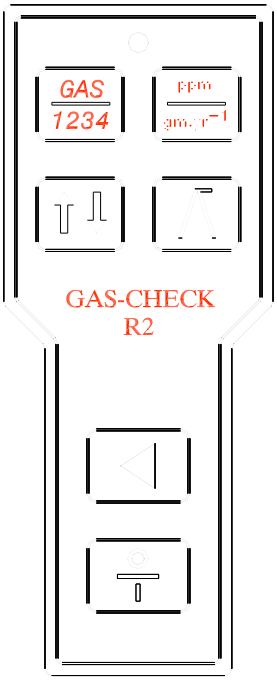
ppm / gm/yr TOGGLE (5) Operable only in *Peak mode*. Use this to switch between ppm and gm/year settings when needed. The default is gm/yr, and is not displayed; only ppm is displayed when active. When Peak Mode is recovered by turning the instrument on or pressing the Peak Mode key, the most recently selected units (ppm or gm/yr) are recovered. The instrument's calibrated responses are referenced to ppm of gases. Conversions are then made to gm/yr assuming a molecular weight of 100 gm/mol:

1 ppm = 8.6 x 10^{-3} g/yr.

PEAK MODE (6) This key activates *Peak Mode*, enabling a measurement of leak rate. On pressing the key, the instrument enters 4 sequential states:

State	*Description*	*Display*
1	Zeroes instrument as per Zero key	Sequential bars
2	Seek response	Flashing Peak icon
3	Peak measurement (retain probe at leak location)	As 2, with changing bar display and audio signal
4	Register peak	Fixed bar display, Peak icon

Note that key operation is only possible in Peak Mode states 2 and 4. Upon the sequence Peak mode, state 4 → Roaming mode → Peak mode, the reading obtained in state 4 is recovered. In Peak mode, the Peak mode key is only active in state 4, causing a return to state 1. Finally, note that the audio output reproduces the actively detected signal even when the signal falls below the stored peak hold value.



1	Power	4	Gas/1234
2	Zero	5	ppm / gm/year
3	Roaming Mode	6	Peak Mode

Figure 5 – Control keys for Gas Check R2

4.2 Display

4.2.1 General

The display indicates the leak rate, and instrumental status, including user changes to the settings. The upper portion of the display is allocated for representation of the leak rate by incremental bars (see Section 4.2.2). Instrumental status appears in the lower portion (see section 4.2.3). The Gas Group number is shown at the lower left-hand side of the display when the instrument is in Peak Mode.

4.2.2 Gas Measurement

In Peak Mode, a leakage is displayed as a bar graph and a single exponent for the range of the signal. For example:

IIIIIII **x 10 1 ppm**

Corresponds to a reading of 80 ppm.

4.2.3 Other display symbols

Small display indicators show zeroing, peak hold, low battery voltage, signal conditioning, gain and gas group setting.

Zeroing

This symbol appears whilst the GasCheck is zeroing. **W**hen cleared the instrument is ready for use.

Peak hold

When the 'Peak hold' is flashing, the instrument is ready for use. When the 'Peak hold' symbol is shown on its own, the reading is being held.

Low battery

When the instrument is in use, this symbol indicates that the battery pack is lower than required for use. When the instrument is being charged, the state of the battery is shown on the bar graph display.

Negative

This shows the sensor is still conditioning. Wait until this symbol has cleared before taking a reading.

Hi sensitivity

Sensitivity is at maximum gain. Displayed only in Roaming Mode

Low sensitivity

Sensitivity at 1/16th maximum gain. Displayed only in Roaming Mode

Gas Group

Indicates which Gas Group is selected in Peak Mode. Gas Group 3 is shown in the example here.

4.3 Recommended leak search procedure

4.3.1 General procedure

When you use the GasCheck, do not allow dirt or debris to enter the end of the probe. If the probe is blocked, the GasCheck will not operate correctly.

Ensure the part under test contains a reasonable percentage of a detectable target gas!

Turn instrument on, allow to zero, and activate *Roaming mode* by pressing the ↑↓ key. Press this key again if necessary to ensure 'H' is displayed, denoting high sensitivity. Move the end of the probe (or nozzle) around the area of a suspected leak and look at the display (or listen to the audible clicks or note the visual LED flash rate on the GasCheck) to identify the location of a leak. Specific procedures for leak detection along seams and around pipe joints are described in the following sections.

When required:

- Use 'L' lower sensitivity in conjunction with 'Peak hold' to pinpoint large leaks.
- If you want to zero the GasCheck, move the end of the probe (or nozzle) away from any possible leak, into a clean air zone, then press the manual zero key: refer to Section 4.1.

Note that leak sensitivity depends on the ambient conditions. If you want to accurately measure a leak, compare the indicated leak with a calibration standard, such as obtained with Ion Science's CalCheck: see Section 7.3.

When the GasCheck indicates that a leak has been found, move the probe back to determine the precise location of the leak. The leak is located where the largest leak bar indication is displayed, and where highest frequency clicks and visual flashing rate are emitted by the GasCheck, on the current range.

4.3.2 Leak detection along seams

Move the end of the GasCheck probe (or nozzle) along the length of the seam, so that it just rests on the seam. The speed at which you move along the seam will determine the size of the leak detectable:

- If the leak is large, you can move fairly fast along the seam, at approximately 20 mm per second.
- If the leak is very small, move slowly along the seam, at approximately 5 mm per second.

4.3.3 Leak detection at pipe joints

Use the same procedure as for leak detection along seams (see Section 4.3.2), moving the nozzle at half the speed specified. Refrigerant gases are heavier than air and also usually diffuse quite slowly into air, so indicated leaks may be slightly displaced from their actual source.

4.3.4 Leak measurement

When a leak is found in Roaming mode, withdraw the probe from the leak site and move to an ambient location. Use the Peak mode key to activate Peak mode. Allow instrument to zero. Return the probe to the leak site, and maintain it in position as the leak is registered. This will usually take about 15 seconds, and will be indicated by the permanent display of the peak icon. Retract the probe from the leak. The instrument will also display the peak leak registered by the instrument. Press the zero key before repeating the procedure.

4.4 Switching off the GasCheck

When the GasCheck R2 is not required immediately, but will be used again, leave it switched off but still plugged in to the main power supply. This is for recharging the batteries and heating the sensor ready for future use. When the GasCheck is not going to be used again for an extended period, switch it off to conserve the batteries.

5 MAINTENANCE

5.1 Inspect and clean the GasCheck

CAUTION Do not clean the probe while it is attached to the GasCheck and do not try to clean the sample hole

1. Switch off the Gas Check.

2. Refer to Figure 5. If the probe is fitted, hold the probe (1) by its quick fit bayonet and gently twist it anti-clockwise to remove it from the GasCheck R2.

3. Inspect the GasCheck. If the case of the Gas Check is cracked or dented, we recommend that you do not continue maintenance, but return the GasCheck to your supplier for inspection and calibration.

4. Wipe the GasCheck with a clean, lint-free cloth moistened with a weak solution of detergent.

5. Carefully wipe the outer faces of the probe to remove any small particles of dirt or debris.

6. Use a gentle air flow to dislodge any particles within the probe – but not done with the probe attached.

7. Use a suitable tool to push any blockage out of the end of the probe, and then wipe the outside of and the inner face of the wide part of the nozzle.

8. Refit the required probe to the GasCheck: refer to Section 4.4.

9. Place the GasCheck and the long probe separately in the storage case. Store the case in suitable conditions: refer to Section 6.1.

5.2 Replacing the batteries

WARNING
Replace the batteries in the GasCheck R2 in a safe area where there are no flammable gases. If you do not, there may be a risk of fire or explosion.

WARNING
Use only Ion Science Recommended parts for the rechargeable batteries. The recommended batteries are specified in section 2.3 Battery Data.

Note: A spare battery holder is supplied with the GasCheck. Use of rechargeable batteries reduces effort.

1. Refer to Figure 6. Turn over the Gas Check so that the battery compartment is at the top: see detail A.

1	Catch	3	Battery compartment
2	Battery compartment cover	4	Serial number

Figure 6 – Replace the batteries

2. Use a small coin, screwdriver or your fingernail to press the catch (1) on the battery compartment cover (2), then pull up and remove the cover: see detail B.

3. Remove the battery holder from the GasCheck. If required, you can carefully unplug the battery holder so that you can detach the holder from the GasCheck.

4. Remove the old batteries (4) from the battery holder. Dispose of the batteries (see section 6.2).

5. Inspect the inside of the battery compartment and battery holder. If the batteries have leaked, use a cloth dampened with a weak solution of detergent to clean the battery compartment and battery holder.

6. Fit four new batteries in the battery holder. Ensure that you fit the batteries in the correct orientation. To reduce the risks of incorrectly connecting the battery clip remove one battery before you refit the battery holder to the GasCheck. You then add the fourth battery into the clip before pushing it home.

7. Refit the battery compartment cover (2) and ensure that the catch (1) is engaged. Switch on the Gas Check. If the display remains blank when you switch on the GasCheck, refer to section 5.3.

5.3 Battery Charging

Battery charging can be carried out with the instrument turned on or off. If the instrument is turned off, upon plugging the battery charger into the instrument display will illuminate, indicating the progressive degree of battery charging that has taken place. If the batteries are severely depleted the sensor circuitry is automatically switched off to ensure maximum charging capability. It is recommended instead, to routinely attach the battery charger, whereupon the instrument is automatically trickled charged whilst maintaining the sensor in an activated condition, ready for immediate use when the charger is removed.

5.4 Fault finding

Fault symptom	Diagnosis	Action
Unit will not switch on	No/dead batteries fitted	Try another battery set (safely)
Unit will not switch off	Software locked out	Remove & replace battery clip (safely)
Battery symbol appears	Battery state low	Replace batteries (safely)
Unit shows negative symbol	Sensor not warmed up yet	Ensure sensor left on if needed quickly
Display appears blank/dim	Contrast control setting wrong	Turn off & on; press & hold contrast
Numbers do not change	Peak hold selected	Press zero or change from Peak hold
Range does not change	Range not set in Auto-range	Press & hold Range until Auto-range
Gas group is wrong	Gas Group not set correctly	Press & hold Gas until shown OK
Blocked probe	Probe blocked	Remove probe and clean
Instrument readings noisy	Test environment contaminated	Move item under test into cleaner area
Error 'E' + 'Zero' symbol	Detector not ready	Charge to allow the sensor to warm up
Error 'E' + 'Battery' symbol	Mains power off during charge	Check power to instrument applied

Table 5 – Fault finding

6 STORAGE AND DISPOSAL

6.1 Storage

If you will store the unit for a long time, we recommend that you remove the batteries: refer to Section 5.2
Refit the GasCheck in its storage case and store in dry, cool conditions. Unpack as described in Section 3.

6.2 Disposal

Dispose of the GasCheck, components and used batteries safely in accordance with all local and national environmental safety requirements. Some of the GasCheck carry case plastic material is recyclable.

7 SPARES AND ACCESSORIES

7.1 Introduction

Order spare parts from your local agent or distributor, when you order, please state for each part required:

- Serial Number stamped on your GasCheck refers to Figure 6.
- Item Number and description of part.

7.2 Spares

Spare	*Item Number*
Rechargeable batteries (4 off)	1/BM-01
Replacement battery holder	1/BH-01
Short Probe R2	A-19043
Long Probe R2	A-19045
Case	28367C
Instruction Manual	SPR2MAN

7.3 Accessories

Accessory	*Item Number*
Power supply for battery charger	
- specifying UK mains plug	1/VS-09
- specifying Euro mains plug	1/VS-10
- specifying USA mains plug	1/VS-12
Portable reference leak - specifying gas, leak rate and pressure	Cal Check

7.4 Calibration

Ion Science offer a calibration service including issue of traceable certification to National Standards.

7.5 Refurbish program

Ion Science offer a refurbish service for all customer repairs.